



SUGAR AND PLANTATION NEWS



"HEAT CONSERVATION IN CANE SUGAR FACTORIES"

A REVIEW BY LORRIN A. THURSTON.

Under the above title Mr. R. Renton Hind, of Honolulu, has produced a book of 150 pages containing more clear cut, condensed information concerning this phase of the sugar industry of Hawaii than has ever before been put into condensed space. The book is written from the standpoint of practical advice from an experienced engineer to men who are in the practical business of carrying on sugar manufacturing in this Territory; but the fact that it is primarily written for the information and benefit of engineers, does not render it any less interesting to laymen who want to keep posted on the current questions of the day, more particularly concerning matters which are vital to the commercial prosperity of the section in which they are living.

It probably has not occurred to many persons, but it can readily be seen after reading Mr. Hind's book that whether heat is properly conserved in a mill or not, may make all the difference between profit and loss.

That Mr. Hind is competent to discuss the subject of his book does not need to be stated to those who know him. To those who do not, it may be stated that he is "an island boy," being the son of Mr. John Hind, of Kona, to whom this book is dedicated. Mr. Hind is a Stanford University man and served his apprenticeship in the Blaston Iron Works of San Francisco. For 5 years he was mill superintendent of the Hani Mill at Kona, succeeding Norman G. Campion as Chief Engineer of the Ewa Plantation in 1915, which position he retained until two years ago when he was appointed Consulting Engineer for the Honolulu Iron Works Co., which position he held until lately when he accepted a similar position for all the sugar plantations represented by H. H. H. & Co.

Mr. Hind has been prominent for the last several years in connection with the reports for, and discussions at, the annual meetings of the Hawaiian Sugar Planters Association, in connection with advanced methods and machinery for the manufacture of sugar from cane.

HEAT LOSSES AND THEIR REMEDY

The book in question deals specifically with the subject of direct and indirect heat losses in a cane sugar factory and suggests means for their prevention.

In addition to this specific subject the book is filled with a running fire of condensed information upon a great variety of subjects bearing upon the sugar industry.

In the preface the author points out that his experience as a practical engineer has drawn his attention to the need of a concise reference work on the subject of heat losses and their remedies. He states that cane sugar factories in the tropics are fortunate in that the bagasse furnishes sufficient fuel for all purposes of power, heat and evaporation. If they are unable to do this it is evidence that the available heat in the bagasse is not being utilized to the best advantage. This condition may be due to faulty operation, or to the lack of proper apparatus or methods. The book in question is intended to aid the operator to find out what the adverse conditions are and how to remedy them.

THE FIRST REQUIREMENT

In the introduction the author says that the engineer must, in his search for the sources of loss of heat, first analyze the preventable losses which are taking place; determine their extent; endeavor to gain a knowledge of their causes and then aim to eliminate them.

As a means toward this end a diagram is given showing on one page a condensed sketch of all the apparatus and processes in a sugar mill where heat may be lost, thereby vividly presenting to the investigating engineer a list of the points to which his attention must successively be directed.

It is pointed out that modern milling methods in Hawaii have attained to such a degree of efficiency that the moisture in the bagasse has been reduced by purely mechanical means to as low as 35% resulting in the highest known extraction of sucrose, which has necessitated many changes in fire room equipment and methods due to the altered mechanical structure of the bagasse.

On the other hand these high sucrose recoveries are accompanied by a greater percentage of impurities in the juice, which again call for changes in methods of operation in the boiling house.

FACTORIES HAVE BECOME UNBALANCED

It goes without saying that in many factories advance has been made along one line or another of improved manufacture without corresponding necessary changes being made in the other parts of the factory. In other words factories have been thrown out of balance by the improvement in individual apparatus and processes. Mr. Hind's book will be of especial value to the managers and engineers of mills which are subject to such conditions, and who are seeking to get their factories into balance again.

The book is divided into 5 sections and an appendix.

Section I deals with the general subject of how heat may be economized.

VALUE OF CONTINUOUS OPERATION

For example it is brought out that continuous operation to maximum capacity is far more efficient as a heat conserver than if the work is interrupted. It is pointed out that where in a certain factory, if less than 1200 tons of cane are ground per 24 hours, extra fuel is needed in the furnaces; 1200 tons produces an exact balance and if this quantity is exceeded a surplus of fuel results.

WHAT A "UNIT OF HEAT" IS

An example of the incidental information running through the book is contained on page 13 where the statement is made that "the unit of heat used in mechanical engineering is the heat required to raise a pound of water one degree Fahrenheit." As the degree of heat required for this purpose is not always the same at different temperatures, standards of measurement have been fixed. A majority of authors have fixed the unit at the amount of heat required to raise a pound of water from 63° to 64° Fahrenheit. Others use the range of temperature between 39° and 40°. This unit is called the "British Thermal Unit," commonly referred to as B. T. U. This standard is the one used by the author throughout the book.

SOURCES OF HEAT LOSS

The sources of heat loss enumerated and discussed are as follows: 1. Chimneys. 2. Ash pit. 3. Radiation. 4. Condenser tail pipes. 5. Vaporization of exposed hot liquids. 6. Press cake. 7. Sugar. 8. Waste molasses. 9. Steam leaks. 10. Cooling of crystallizing masscutes.

LOSSES IN MILL AND BOILER ROOM

Section 2 of the book enumerates and discusses heat losses and remedies thereof in the mill and boiler rooms. Under this general head are discussed, for example, engines, steam leaks, and cooling of maceration waters.

Under the head "Cooling of Maceration Waters" the author shows that by a simple change in method without additional expense, in a certain mill the temperature of the juice was raised from 80° to 101° representing a saving equivalent to 32,000 pounds of bagasse per day.

THERMAL VALUE OF BAGASSE

The statement is made that the thermal value of dried bagasse is 8100 B. T. U. per pound, the heat value of which is decreased 81 B. T. U. by each increase of 1% of moisture in the bagasse. In other words bagasse with a moisture content of 35% contains 810 more B. T. U. per pound than a bagasse of 45% moisture; or to put it in another way, a reduction in moisture of 10% increases the fuel value by 19%.

It is apparent, therefore, that the value of bagasse as fuel depends directly upon the amount of moisture therein, the author discusses ways and means of partially drying the bagasse on its way to the fire room. This process has not as yet met with success commercially. There is some, although not much, opportunity for development along these lines, as mechanical milling has been brought to such perfection that actual results have been obtained producing bagasse of only 30% moisture.

FURNACES: The principles of combustion in furnaces and the different methods of securing the greatest amount of heat in the furnaces is discussed at length, especially emphasis being given to the value of the "Ginsac-Keech furnace," which is illustrated.

SUPERHEATED STEAM

The advantages of superheated steam as a power producer are strongly set forth.

FUEL VALUE OF BAGASSE: A table is given showing the actual amount of water evaporated by a pound of bagasse based on actual figures from the Pioneer Mill Company. From this it appears that during a period of three months, each pound of bagasse evaporated from 2.47 to 2.81 pounds of water.

FLUE GAS LOSSES: The author states that one of the chief sources of heat loss is through the flue gases. He states that losses occurring through this medium have a greater influence on economy than any other which the operator

has to deal with. A strong recommendation is made that the "Orsat apparatus" be kept in every mill to check this source of loss.

RADIATION: It is stated that next to the losses in the fire room, the greatest source of loss in a sugar factory is radiation from pipes and other surfaces. The average factory shows little evidence of thought having been given to the subject of a minimum quantity of piping necessary. The author cites a typical mill in Hawaii in which 14,355 linear feet of piping were in use, the radiation from which he estimates at 100 boiler horse power with uninsulated piping. The method of insulation are also discussed. It is pointed out that the loss of heat by radiation of a naked or improperly insulated steam pipe in a typical Hawaiian mill is as high as 5%; a loss in money equivalent to \$19.50 a day with oil at \$1.50 per barrel.

LOSSES IN THE BOILING HOUSE

Section 3 relates to the boiling house. Each process in the house is taken up successively. Particular stress is laid upon the advantages of multiple effect evaporation, diagrams accompanying the argument demonstrating that the saving of a quadruple effect over a single effect, operated by the same amount of fuel, is 75%.

The author is of the opinion that it would pay to install even a quintuple effect. By "multiple effect" is meant that the steam from a succession of evaporating pans or containers is successively carried over and used to evaporate the water in the succeeding container, the evaporating being done in vacuo.

VALUE OF PRE-EVAPORATION

The high value of pre-evaporation is also elaborated upon, reference being made to experiments in connection therewith carried out by Barnes Johnson, an installation at the mill of the Hawaiian Agricultural Co., showing that prior to installation of the pre-evaporator, 40 tons of cane per hour were ground, while 43.0 tons per hour, were ground after the pre-evaporator was used, with an increase in water evaporated of 30.3%.

WATER USED IN PROCESS

It is pointed out that another method of economizing heat to which little attention is usually paid, is in the amount of water which is allowed to enter the juices, molasses and masscutes during the process of manufacture.

ELECTRIC DRIVEN MOLASSES PUMPS, ETC.

Section 4 is devoted to a general discussion of a number of subjects, including the economy of electric motor drives, molasses as fuel, power obtainable from exhaust steam, etc.

The author has had much experience in the installation of electric individual motor drives in sugar mills. He is of the opinion that it is not economical in connection with the driving of the mill, for reasons which are given in detail, but that it is an extremely economical method of manufacturing and applying power for auxiliary machinery. The author states that he is "an enthusiastic advocate of motor driven units at every possible station in the mill."

APPARATUS FOR HEAT CONTROL

A particularly valuable list is given on page 113, of apparatus for control of heat losses. The apparatus enumerated includes scales for the weighing of fuel, for fuel water measurement, the measurement of steam at the boiler, the measurement of flue gases, etc.

MOLASSES AS A FUEL: There is a full discussion of the value of molasses as a fuel. It is stated that a pound of molasses is approximately the equivalent in fuel value to a pound of bagasse. Figures are also given showing that in certain cases there is greater economy in burning molasses independently for the purpose of obtaining the potash therefrom. The methods for securing potash recovery are described.

The book concludes with an appendix of tables and statistics of information of a varied nature, such as an engineer, or layman for that matter, frequently wants to know but which are widely scattered. They are here condensed.

The book contains 24 cuts, illustrations and insets to graphically illustrate the text. It is also provided with a full index.

This is one of, if not the first book of a technical character relating to sugar, published in Hawaii. It demonstrates the advanced state of the industry here, and the high engineering standing of the men who are controlling it. It is a credit to the author and to the Territory.

The book is published by the Hawaiian Gazette Co., and is for sale at the office of that company, or at any book store in Honolulu, at the net price of \$2.00.

SHIP SITUATION IS DISTURBING

Commandeering Vessels For War May Skyrocket Sugar Price Too High

A New York review of the sugar market, under date of April 5, received this week by a local sugar house, says:

"With the exception of the sales of Cuba and Porto Rico to refiners on the 30th ultimo, at respectively 4% C. & F. for prompt and April shipment, and 3.75 cents C.I.F. prompt shipment, and also comparatively small sales to refiners on the 3rd instant at 5 cents C. & F. and 4.50 cents C.I.F. for May and April shipment, all of the sales recorded up till today have been to operators who must sooner or later dispose of their purchases to other hands."

"These operators have been buying in the belief that the entry of the United States into the world war means the commandeering of steamers and various actions likely to affect the natural channels of trade to such an extent as to send prices of sugar skyrocketing still more. They are also speculating on the possibility that the revolution in Cuba will stopper shipping for some time with the result that much more cane tonnage will go up in smoke. Further, there is the sufficient quantity to seriously delay, if not stop, the harvesting of cane."

Harvesting Interrupted

"The continual interference of one kind or another holding back the cane harvesting have given rise to a feeling of pessimism as to the outcome that may or may not be justified by results. It is significant in this connection that El Sordo Central has finished its crop with an output of 82,000 bags against an estimate of 275,000 bags, while Jobabo has also been compelled to stop with only 60,000 bags against an estimate of 300,000 bags."

"It is known, too, that the Stewart Central has suffered severely at the hands of the rebels, but whether their leaders permitted them to do serious injury to the factories themselves is not yet known."

Visible production for March 31, 1917, is estimated at 1,333,278 tons, against 1,605,292 tons to the same date last year, and 1,204,707 tons to March 31, 1915. According to Willett & Gray the total stock in all ports of the island at the same date is estimated to have been 617,000 tons against 735,000 tons in 1916, 634,000 tons in 1915, and 675,000 tons in 1914. The number of central in operation outside of the Western Provinces is still an unknown quantity."

Market Strong

"Late yesterday, Howell took 5000 new Cuban for April shipment at 4.75/32 cents C. & F. and today the market has strengthened as Howell took 12,000 bags more in the same position at the same price, and the Federal and Warner 50,000/00,000 bags

Cuba prompt and last half April shipment at 5 cents C. & F. 8411 later the Federal bought 10,000 bags April clearance at 5.1/32 cents. Cuba have been sold in very fair quantities at 4.55 cents to 4.63 cents C.O.B., presumably for Europe.

The Cuban figures for the week ending 31st ultimo (in tons) are again for six ports only:

Receipts	Exports	Stock
100,200	55,500	462,000
108,023	50,455	460,190

Exports north of Havana: 31,500 27,356

Exports to New Orleans: 10,000 5,979

Exports to Europe: 13,500 13,000

Exports to Mexico: 500

Output statistics available show that 10,036 tons were exported to Europe, 6,114 tons were exported to U. S. Atlantic ports.

1,880 tons were exported to New Orleans.

24,036 tons in all.

The weather is favorable for harvesting.

Refiners Holding Back

"Refiners are still restricting business. The American and Howell started the week quoting 7.25 basis and doing a little business at that figure, but on Thursday Howell advanced the price to 7.50 and later on withdrew from the market completely."

"What the American has taken in the way of business has been scrutinized very carefully with the purpose of restricting purchases and discouraging speculation. The other refiners have held firmly to 8-cent basis until this afternoon, when the Federal advanced its basis to 8.25 cents. It is reported that Arbuckle have done a very fair amount of business today at 8-cent basis. Some business has been done for export through second hands at about 6.50 cents basis, but refiners are holding for from 6.75 to 6.85 cents net cash in hand. A very considerable volume of business has been done in the option market all of this week, and though there was some hesitation for the past day or two the advance has been repeated again today with all the options up from 5 to 8 cents."

DOUBLE HEATING SURFACE FROM VERTICAL TUBES

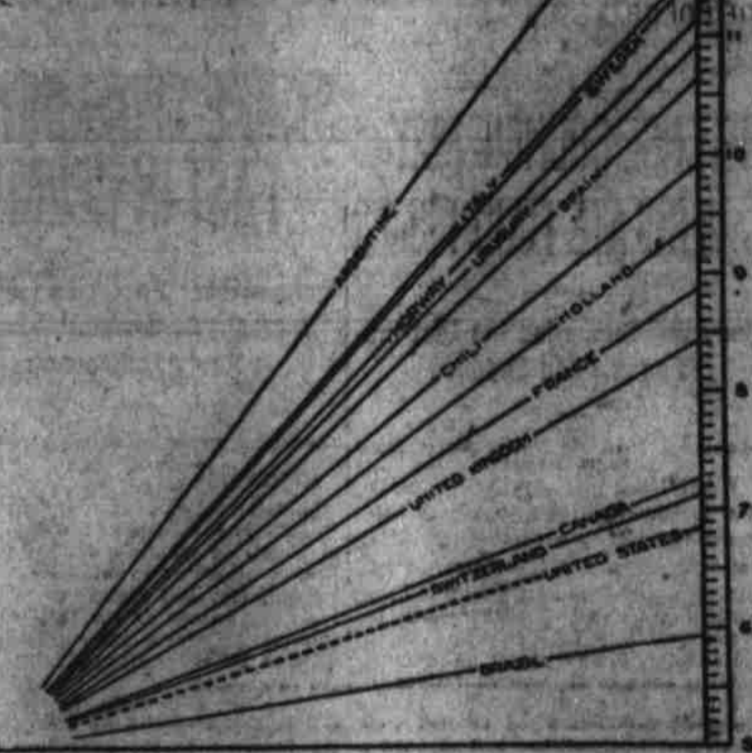
Vacuum pans equipped with vertical tubes instead of the usual arrangement of tubes at right angles to the tube sheet are giving entire satisfaction at Puunene mill where they have been in operation for the first time this year. Practically double the heating surface is provided by the vertical tubes in the same space as is obtained in the ordinary exhaust calandria with the tubes at right angles.

This novel design, permitting the vertical tubes to be used with a dish end calandria, is accomplished by the simple process of getting the endings made in steps in order to get the right angle with the tube in a vertical position. A calandria of this type that was in operation at Kahuku last season also gave entire satisfaction and the new one in operation at Puunene is giving such good results that two more are now being put in. Cattan, Neill & Co. is also making a calandria of this design for the California-Hawaiian refinery at Crockett.

A COMPARISON OF PRICES FOR REFINED SUGAR IN THE UNITED STATES AND FOREIGN COUNTRIES DURING 1916

THE QUOTATIONS GIVEN ARE THE AVERAGE WHOLESALE PRICES IN CENTS PER POUND. TO REDUCE FOREIGN PRICES TO UNITED STATES CURRENCY THE AVERAGE RATE OF EXCHANGE PREVAILING DURING THE YEAR HAS BEEN USED.

BRAZIL IS A SUGAR PRODUCING COUNTRY.



—From 1916 Annual Report of the American Sugar Refining Company.

CUBAN REVOLT CUT CROP SHORT

Two Big Centrals Cut Output In Radical Way—Only About Twenty Per Cent

Although conditions in the island of Cuba are improving, the full reports from all the shipping ports are not available as yet, reports Willett & Gray for the week ending April 4. Complete six port figures for the week are: Receipts, 108,023 tons; exports, 37,356 tons to United States Atlantic ports; 5979 tons to New Orleans and 33,090 tons to Europe, a total of 56,455 tons; stock, 460,190 tons. Centrais grinding not given.

Complete advices of exports for the week are received from the following ports:

From Manzanillo to U. S. Atlantic Ports: 1828 tons

From Gibara to U. S. Atlantic Ports: 1856 tons

From Juarez to New Orleans: 1856 tons

From Nuevitas: 3404 tons

From Puerto Padre: 3409 tons

From Manati: 6090 tons

Total exports to U. S. Atlantic Ports: 6114 tons

Total exports to New Orleans: 1856 tons

Total exports to United States: 8000 tons

Total exports to Europe: 16,036 tons

These output exports, taken together, are 24,036 tons for the week. From this it would seem as if the production in the eastern part of the island were going forward steadily and in good volume. The exports for this week last year were 43,033 tons to United States Atlantic ports, 24,960 tons to New Orleans, 5900 tons to Galveston and 31,500 tons to Europe. Visible production to March 31, 1917, we estimate at 1,333,278 tons, against corrected actual production to March 31, 1916, of 1,605,292 tons, and to March 31, 1915, of 1,204,707 tons. Total stock in all ports of the island is estimated at 617,000 tons.

Rebels Cut Crop Short

An interesting and valuable item was contained in our cable from Cuba in the shape of a report that Centrais Sordo and Jobabo have finished their crop owing to damage to property and cane fields by revolutionists. Centrais Sordo made 82,000 bags crop, against first estimate of 275,000 bags, while Centrais Jobabo made 60,000 bags, against estimate of 300,000 bags. This report is a confirmation of the rumors that have been spread in the trade regarding some of the factories in the eastern end of the island. This very large shortage of production applies to but very few, if any, additional factories, and full account of such a decrease has already been taken cognizance of in the reduction that has been made in crop estimates. Such shortages of production obviously cannot be taken as a criterion and applied to all Centrals in Cuba.

During the early part of the week the weather was reported as unsettled, while later reports mention scattered heavy rains.

PUUNENE JUICES RUN ABOVE THE AVERAGE

Juices at Puunene mill are running much better this season than last year. Though the tonnage of cane yield was heavily affected by the storm early in 1916, the quality of the juices now being obtained is excellent.

WOLTERS MANAGER OF MAKEE PLANTATION

H. Wolters, formerly a head overman on Lihue plantation, has been appointed manager of Makee Sugar Company plantation to fill the vacancy caused by the resignation of G. F. Wilcox.

Mr. Wolters has been connected with the sugar industry on the islands for the last twenty-five years. He was with Lihue plantation for some time and later with Kekaha plantation, returning again to Lihue where he was in charge of the Hanalei section for many years as head overman.

Mr. Wilcox resigned, planning an extended visit to the mainland. At the same time he resigned as a colonel in the national guard regiment on Kauai. War was declared soon after and Mr. Wilcox withdrew his resignation and is now devoting his time to the country's service.

Based on government weather reports and notes from the press to April 3, 1917:

Following the light rains or snow over the beet sections early in the week, weather has been generally clear, with temperatures averaging slightly higher. The late spring is beginning to worry the growers, and the frost remaining in the ground prevents the moisture from sinking in, leaving the roads and fields in a most impassable and unworkable condition in many districts. A few clear days, with a strong sun, would work wonders in drying out the soil and permit plowing, little of which has been done.

The press reports that distribution of seed by the Great Western Sugar Co. has begun at the Loveland, Colorado, factory. The allotment is understood to be the same as last year, say fourteen pounds to the acre. Facing a scarcity of seed last year, the company at first announced that only twelve pounds of seed to the acre would be allowed, but the receipt of additional seed later permitted fourteen pounds to be distributed. There is said to be plenty of seed available for this year.

Advices from Michigan are to the effect that an adjustment has been made between the farmer and sugar companies over the price to be paid for beets. The latter allowing the advance asked by the growers. Both sides vouching for their honesty, and little contracting was being done, with probably not more than half a normal acreage for the State signed up, but at the new price no shortage of beets is looked for.

It is reported from Wyoming that the factory at Sheridan may not work this campaign owing to the fact that, so far, satisfactory acreage has not been obtained.

The regular annual meeting of the stockholders of the Utah-Idaho Sugar Co. for the election of directors it is said will be held on April 10. Both the Amalgamated Sugar Company and the Layton Sugar Company are understood to have paid on April 2 quarterly dividends of three per cent.

ELECTRIFICATION GOES FAR AT PUUNENE MILL

Electrification is being carried further at Puunene mill than at almost any other mill in the islands. Here all pumps and all machinery with the exception of the mills is now electrically driven. Power is furnished by two 750-kilowatt turbo-driven G. E. generators which work at the normal pressure on the mill, ranging of 100 pounds to the square inch and exhaust against ten pounds of back pressure. The reason for working under what would normally be considered unfavorable conditions is that the power problems are figured on the heat basis, inasmuch as that has to be done. The only loss is in the condensation in the turbine casing.

not one has been found accurate enough.

Hand Weighing Best

Puunene continues to have its sugar bagged and weighed by hand on the ground that three types of automatic weighing machines have been tried and

SEARBY LEVELER PROVES A SUCCESS

Operated During Two Seasons In Big Maui Mill It Stands Practical Tests

Of cheaper construction and greater durability, a new type of cane leveler for preparing the cane in order to give an even feed to the crusher and mills has been designed by William Searby, mill superintendent for the Hawaiian Commercial and Sugar Company.

Operated late last season and all this season at Puunene, the new device, which has been patented by the inventor under the name of "The Searby Cane Leveler," has given signal success. The results obtained, according to Mr. Searby have been as good or better than other types of cane levelers or knives used for preparing the cane for the mill.

Chief Advantage

The chief advantage gained by the Searby cane leveler is that the knives are so arranged that they are flexible in two directions—sideways and circumferentially. By this arrangement the knives are not subjected to the crystallizing vibrations that so seriously impact the efficiency of the rigid type of knife blades. With the side and circumferential flexibility of the knives there is much less breakage of knives, and hence greater durability of equipment.

Cheap Construction

The other main advantage of the Searby cane leveler is the cheaper construction. It costs much less to construct than any other form of cane leveler heretofore used in the islands.

This leveler is also designed for high speed and can be operated without danger. At Puunene these levelers have been cutting down the cane on the carriers while operated at a speed averaging between 900 and 1200 revolutions a minute.

The design of the Searby cane leveler has been furnished both the Honolulu Iron Works and Cattan, Neill & Co. and both firms have full details of construction.

PLENTY OF SEED FOR BEET STANDS

Based on government weather reports and notes from the press to April 3, 1917:

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